Making Sense of Artifact Reusability in Early Design

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Abstract
Existing artifacts are the greatest resource, especially in the ideation phase, when designers are striving to come up with novel ideas. Systems allowing effective representation of artifacts could greatly benefit the early design process by providing access to relevant prior artifacts. However, there is a lack of such design support systems, which forces designers to employ ad-hoc strategies for accessing and utilizing needed artifacts. Here, we describe our research aimed to understand factors influencing reusability of artifacts during the early design process. Our findings indicate a need for novel organization and representation techniques to connect artifacts and associated communication not only to capture the early design process but also to support reusability of artifacts in the early ideation phase.

Keywords
Artifact, Communication, Ideation, Reusability.

ACM Classification Keywords
H5.m. [Information interfaces and presentation]: Miscellaneous.

Introduction
Utilization of existing artifacts is deemed imperative during early design phases in the creative design domains [4]. Designers utilize existing artifacts to
understand the design space, as inspiration while generating ideas, to compare and evaluate alternate solutions, etc. [1, 7]. While the importance of existing artifacts is well-understood in later phases of the design process, little research tried to investigate factors impacting reusability during the early design phases. Prior research on early design centered on facilitating artifact creation in terms of sketching and prototyping tools [2, 3], supporting brainstorming sessions [7], tools that facilitate collaboration [6], etc. However, little is known about designers’ practices and attitudes regarding reuse of existing artifacts and factors that would facilitate artifact reusability during the early ideation phase. We aim to fill this gap by studying designers’ artifact management and utilization strategies and issues surrounding reusability.

Figure 1 represents an early design space of a designer interviewed for our study. This space demonstrates the variety and close relationship between different types of artifacts and associated communication during the ideation phase. Such design spaces are typical and indicate a need for novel systems that would provide effective representation of myriad artifacts utilized in the early ideation phase. Our research aims to understand how to better manage artifacts and what needs to be captured and represented to support reusability in the early design process [5].

Our findings indicate – i) reuse of existing artifacts is extremely valued; ii) artifacts and associated communication are the two pivotal components and should be captured and linked for better representation of the design process; iii) designers want (try) to capture, access and utilize artifacts and associated communication but struggle due to ineffective organization and representation mechanism; and iv) novel representation of artifacts and associated communication is imperative for encouraging revisit and reuse of existing artifacts.
Methodology Used
The goal of our research was to understand reusability of artifacts during the early ideation phase. We tried to understand designers’ attitudes and practices surrounding artifact management (collect, create, store, access, share, and retrieve) and its impact on artifact reusability during early ideation phase. More specifically, we wanted to know, how do designers’ collect, store, access, and retrieve existing artifacts and for what purposes they do so. Also, what needs to be captured and represented to support reusability.

We used in-situ semi-structured interviews for our studies as it allowed us to gain insight about designers’ overall experience and their existing practices, without limiting our findings to any specific project or time. It also allowed the designers’ to access and share relevant artifacts with us and allowed us to observe their design space and ongoing design activity. Currently, we are designing a participatory design session to learn about the effectiveness of different representation techniques on artifact reusability. In the workshop we would be able to share our experience with in-situ interview based studies and also hope to learn about other methods that researchers are utilizing to understand activities and the role of artifacts during the ideation process.

What We Learned So Far
Here, we discuss lessons from our research on artifact usage and management in the early ideation phase in the creative design domains, specially focusing on issues surrounding reusability:

(i) Reuse of existing artifacts is extremely valued, but seldom performed by the designers in the ideation phase. Existing artifact management systems focus on capturing either final form artifacts and/or specific types of artifacts (rationale, sketches, etc.) which creates disconnection among myriad artifacts used in the early design process. As such these systems fail to support designers’ needs for inspiration and re-appropriation of artifacts during the ideation process.

(ii) Designers want to know the stories associated with artifacts. Capturing artifacts and associated communication is necessary as artifacts alone fail to represent designers’ experience surrounding artifact creation, design decisions taken, etc. As a result, we observed designers often utilize artifacts as a proxy to find appropriate designers.

(iii) Search is necessary but insufficient for retrieving relevant artifacts. Designers, especially in the ideation phase, are often unsure about what artifacts they are looking for. In this stage, designers’ often look for directions and inspiration rather than specific solutions. Keyword-based search fails in this regard as designers’ often fail to express what they are looking for using text-based keywords. Visual representation of the artifact space is imperative for supporting reusability.

(iv) Capturing the process of artifact creation is imperative. Designers are often interested to learn about the evolutionary process of an artifact, rather than looking at the final artifact itself. Storyboards and similar systems are often used in the early ideation stages to capture, represent, and communicate the design process to others [8]. Though promising, such systems lack a close connection between artifacts and different types of discussion surrounding artifact creation that occurs informally face-to-face, over phone, using e-mails and IMs, etc. Also, lack of effective storage and representation mechanism for storyboards often forces designers to discard these
when the project is over. Systems that would capture storyboards and connect it with other artifacts such as design discussions would significantly benefit designers’ in their early ideation process.

(v) Inconsistent organization and representation of artifacts impedes reuse. Though designers value artifacts they have created at past or by other designers they know and trust, it is extremely time-consuming if not impossible to find relevant artifacts from office repository or even from designers’ own machine. As a result, designers often rely on the Web to find inspirational materials in the early ideation phase. Interactive visualization of the available artifact space (and associated communication) would allow designers’ to browse for relevant artifacts without constraining them to search using specific keyword or in a specific location.

Conclusion
In this paper, we present findings from our ongoing research of artifact utilization and management in the early ideation phase. We focus mainly on factors that influence reusability of existing artifacts. Our findings indicate a need for systems that would support novel representation of artifacts and associated communication to facilitate reusability. Our research is one of the first attempts to understand issues surrounding reusability in the early ideation process. We believe by providing better understanding of the true needs of designers in terms of what artifacts need to be captured, how to better store and organize those to support effective retrieval would assist in designing better design support systems for early ideation phase.

Currently, we are designing systems that would provide novel representation of the early ideation process by capturing both artifacts and surrounding communication. In this workshop, we want to share our findings and ideas and hope to receive valuable insight from other design researchers in the community. By discussing issues surrounding effective representation of artifacts and associated communication, we believe we can significantly improve future design support systems.

Reference